

## Biogenic carbonate sediments of the Island of Magoodhoo, North Nilandhe Atoll, Maldives

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Reef-islands on atolls are particularly vulnerable to the expected impact of rising sea-level due to the ongoing global warming. The possible drowning would affect dramatically an entire nation, the Maldives, located on low-lying reef-islands SW of India.

Islands form on reefs as 3-D accumulation of  $\text{CaCO}_3$ . Reefs are dynamic structures, whose integrity is strongly dependant on net rates of carbonate production and accumulation. The carbonate budget is controlled by eustatic and isostatic processes, climatic and oceanographic factors, and the biology of carbonate producers.

We studied the composition of carbonate sediments along 13 transects crossing the reef flat of the Island of Magoodhoo, North Nilandhe Atoll (3°04'42"N, 72°57'50"E). For each transect, the seafloor profile perpendicular to the shoreline was traced by snorkeling, and the benthic facies zonation was identified by visual descriptors. Sampling was performed at each facies change, for a total of 59 samples. Grain-size analyses, identification and weighing of seven groups of the >2 mm carbonate components (corals, coralline algae, forams, Halimeda, gastropods, bivalves, other) were carried out on the 59 samples, and results were elaborated by multivariate statistical analysis, in order to identify common patterns.

The distribution of carbonate sediments around the island shows a marked asymmetry and coarsely mirrors the visual benthic zonation. Three macrobenthic sedimentary facies were recognized: 1) HALIMEDA FACIES, dominant to the NE in mainly sandy sediments; 2) CORALLINE ALGAE FACIES, dominant to the NW in muddy sand; 3) CORAL FACIES, made of coral rubble and very coarse sand, dominant to the S. No depth-related pattern can be detected in the distribution of carbonate components. On the contrary, the most significant control seems to be the current regime, since *Halimeda* and coralline algal facies dominate on the lagoon side of the island, whilst coral facies dominate on the reef flat facing the channel between atolls.

Active production of green and red algal carbonate is recorded on the Magoodhoo reef flat. Corals are producing a large amount of rubble as a consequence of the 1998 global bleaching event, the 2004 tsunami, and the 2009 local bleaching event. This destructive sequence is hampering the natural recovery of the reef, which is presently shifting to an erosional state. The deterioration of the building potential of corals rather than the ongoing sea-level rise is presently the most severe threat to the survival of the island.

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